not always well chosen. There are other evidences of hasty writing. There is a large crop of errors in the appendix. Mass is defined as the density of unit volume! "The unit of force is that force which, acting for one second on a mass of one gram, produces an acceleration of one centimetre" (p. 500).

ELECTRO-PHYSIOLOGY.

Studies in Electro-physiology (Animal and Vegetable). By A. E. Baines. Pp. xxix + 291. (London: G. Routledge and Sons, Ltd., 1918.) Price 12*s.* 6*d.* net.

THE author of this book was trained as a submarine-cable engineer, and many years ago, while engaged in cable testing, he observed an unexpected deflection of the galvanometer, which he finally traced to the disturbing electrical action of his own body. An interest in electro-physiology was thus aroused, and he was led to undertake a series of experiments which, in his own words, "convinced me that a force resembling electricity, if not identical with it, was constantly generated in the body." He followed this up by making numerous observations on plants and on the human body in health and disease, and this book is the result.

Unfortunately, the author has had no training in biology, and he altogether fails to realise the difficulty of making advances in any field of scientific work without a good knowledge of general principles and of the results attained by previous workers. His attempts to acquaint himself with the literature of the subject have certainly, in some directions at least, been unfortunate. Using as a basis first a quotation from a text-book of botany which was out of date many decades ago, then a paragraph from Sachs's well-known work published in 1882, and, finally, the absence of any reference to the subject in a more recent *elementary* text-book, he arrives at the conclusion that there have been practically no observations on "vegetable electro-physiology." Had the author no plant physiologist among his acquaintances who could have referred him to the works of Jost and of Pfeffer? In Pfeffer's work he would have found a *résumé* of the subject, and he would have realised that there was nothing new in the observations which he made in the year 1900 of the electric current to be obtained from an apple. That a difference of potential exists between different organs of the same plant and between different parts of the same organ and even of the same cell has been known for a long time.

The author is sadly led away by analogy of the crudest description. The book is dedicated to the medical profession, but the extraordinary comparison of animal and vegetable structures shown on pp. 120–26 will scarcely appeal to its members. One finds a ganglion-cell compared with a germinating spore of Vaucheria, a transverse section of a spinal cord compared with a bean root, a transverse section of a sciatic nerve compared with a single parenchyma-cell from a bean seed, and a muscular fibre compared with a sclerenchyma-fibre. These comparisons are supposed to indicate "the universality of the law which governs all things," but it is not quite clear what that law is.

In the latter part of the book the author attempts to explain the structure of muscle, of nerve, of the eye, etc., on a purely electrical theory in which hypothesis and analogy appear to play the main part. In dealing with the eye the possibility of photochemical action is not mentioned. In the theory of muscular action put forward, the contraction is supposed to be due to the attraction between plates in the sarcomeres, the plates being alternately charged and discharged as a result of the current passing through the motor nerves. In this theory, which scarcely seems electrically sound, the source of the energy required for contraction lies outside the muscle, apparently in the brain or spinal cord. In these circumstances it is difficult to see how even the most sedentary of us escapes "brain fever." The author refers the paucity of results attained by physiologists in this special field of work to the fact that "these great men . . . were not, any of them, trained submarine-cable electricians." He apparently fails to realise that—since the problem is a "border-line" one—such a suggestion lays him open to a very obvious retort. V. H. B.

OUR BOOKSHELF.

The War and the Coming Peace: the Moral Issue. By Prof. Morris Jastrow, jun. Pp. 144. (Philadelphia and London: J. B. Lippincott Co., 1918.) Price 5*s.* net.

A WAR that involves almost four-fifths of the entire world must surely have issues deeper than race-antagonisms, conflicting national ideals, and commercial rivalries. According to Prof. Jastrow, the fundamental issue is moral—"the recognition on the part of the world that an attempt to carry out national policies through the appeal to force, or even by threat of force, is a cardinal sin against the moral conscience of mankind." In practice and even in profession Germany stands for the "might is right" doctrine, but civilisation has increasingly meant the replacement of physical power by factors of a higher order. "Civilisation means the gradual elimination of mere brute force as the weapon to carry out man's destiny." Taking a rather one-sided and traditional view of Nature's strategy, the author sees an inherent contrast between it and the conscious direction of civilisation, and as a modern Zoroastrian he hears in the rattling of the sabre the voice of Ahriman. He gives powerful and solemn warning against the sin, which is not confined to Germany, of employing the power of Ahriman to bring about the triumph of Ahuramazda. He hopes that the liberal and wholesome elements in Germany may eventually save Germany from the domination of a militarist group and false ideals. The primary

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condition of a peace which is more than an armistice must be found in a democratic form of government. The subsequent steps will be arbitration tribunals, disarmament, and an international parliament. These seem far enough off at present, but it is important to make up our minds whether we really desire them, and if not, why not. Prof. Jastrow's wisely written book—careful and restrained throughout—makes for illumination.

The Strategic Geography of the Great Powers. (Based on a Lecture delivered during 1917 to Officers of the Grand Fleet and of the British Armies in France.) By Dr. Vaughan Cornish. Pp. viii+114. (London: George Philip and Son, Ltd., 1918.) 2*s*. net.

WITHIN the compass of a small volume Dr. Vaughan Cornish has tried, not unsuccessfully, to crowd many ideas. He describes the great States of the world as regards their sources of men and materials, and the lines of communication by which force can be concentrated. His point of view is often fresh and always geographical. The distribution of the British Empire is described, not by continents, but by oceans. The old system merely emphasises the gaps in continuity of the Empire. Dr. Cornish's method indicates an appreciation of the ocean as a highway linking together the component parts of the Empire. But land routes may also be of importance. In his treatment of Asia Dr. Cornish insists on the strategic value of southern Turkestan and northern Afghanistan as the eventual crossing-place of the chief lines of traffic from Moscow to Delhi, and from Constantinople, Cairo, and Bagdad to Pekin.

The volume has small coloured maps of Europe, Asia, and the world. The last, on a Mercator projection, would have been a better illustration of the chapters if it had been on an equal-area projection. Dr. Cornish's work is an excellent introduction to the geographical conditions of national security, and should be widely read.

B.S.A. Musketry Score Book for Use in the General Musketry Course. Instructions for Short Lee-Enfield Rifle and Enfield Pattern 1914 Rifle, Using Mark VII. Ammunition. By E. J. Smyth. Pp. 47. (London: Forster Groom and Co., Ltd., 1918.) Price 3*d*. net.

THIS excellent little book is a combination of a book of instruction and a score record. It contains clear instructions for the sighting to be employed at higher ranges after making a group at 100 yds., so that the error of the rifle may be obtained without the long experience with the individual rifle which is desirable but cannot always be obtained. The instructions for the short Lee-Enfield rifle and for the Enfield pattern 1914 are placed together, but are indicated by distinctive borders so that no confusion can arise. The book should prove particularly useful to every Volunteer in order to enable him to know the behaviour of his own rifle on the completion of his musketry course. It is also a most useful guide to the course itself.

LETTERS TO THE EDITOR.

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The Perception of Sound.

As I had the privilege of being consulted by Sir Thomas Wrightson during the later years of his "Inquiry into the Analytical Mechanism of the Internal Ear," and advising him as regards the physical nature of the cochlea and the arrangement of its parts, I may be allowed to try to clear up the various objections formulated by Prof. Bayliss (NATURE, October 17, p. 124), as they chiefly concern matters relating to anatomy or physiology. When Prof. Bayliss looks again at the title of Sir Thomas Wrightson's work, which I have quoted above, he will see that he is in error in supposing that the Wrightson theory deprives the cochlea of the analytical function postulated by Helmholtz. Helmholtz's theory presupposes that the cochlea contains an extensive series of resonators for resolving a sound complex into its component waves; Sir Thomas Wrightson's theory presupposes that the cochlea is a machine designed for the purpose of analysing sound complexes and of registering its component waves as nerve impulses. I fear it is a loose statement of mine on p. 159 of the Appendix to Sir Thomas Wrightson's book that has misled Prof. Bayliss; there I have written that "the *final* analysis must be done in the cortex of the brain even if Helmholtz's theory is true." That I still believe to be the case.

Prof. Bayliss demurs to the opinion I have expressed that no theory of the mechanism of the ear can be regarded as satisfactory that fails to explain the form and the arrangement of its various parts. I have found that to be an absolutely infallible law as regards every part of the animal body concerned in movement. In every bone, joint, muscle, tendon, and ligament which has been investigated the result has been the same—the material of which each is made has been found to be so placed, so shaped, and so arranged as to carry out the particular function which has been assigned to it. Whether we accept Helmholtz's explanation of the mechanism of the internal ear or Sir Thomas Wrightson's, we are dealing with a machine concerned in movement, and it is, therefore, legitimate to infer that its parts are designed to subserve its various movements. The only structural feature of the cochlea explained by Helmholtz's theory is the gradual increase of the basilar membrane from its proximal or fenestral end to its distal or helicotremal end. The elaborate structure of the organ of Corti and the conformation of the canals of the cochlea are left unexplained, whereas in Sir Thomas Wrightson's theory all these matters receive a rational explanation. On the Helmholtz theory we must believe that the rabbit is provided with a more delicate analytical machine than man, and the sloth with a more elaborate one than the most tuneful bird. Nay, we are certain that if Helmholtz's explanation had been the right one, Nature could have secured the necessary mechanism in a much simpler way, namely, by providing the auditory hair-cells with processes or cilia of the requisite qualities and dimensions to serve as sympathetic resonators.

I now come to a very important and very difficult objection that has been raised by Prof. Bayliss. Sir Thomas Wrightson's theory certainly presumes that the fibres of the nerve of hearing are capable of carrying

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